Antibodies Against Three Forms of Urokinase

These antibodies can be used to measure small quantities of three molecular forms of urokinase.

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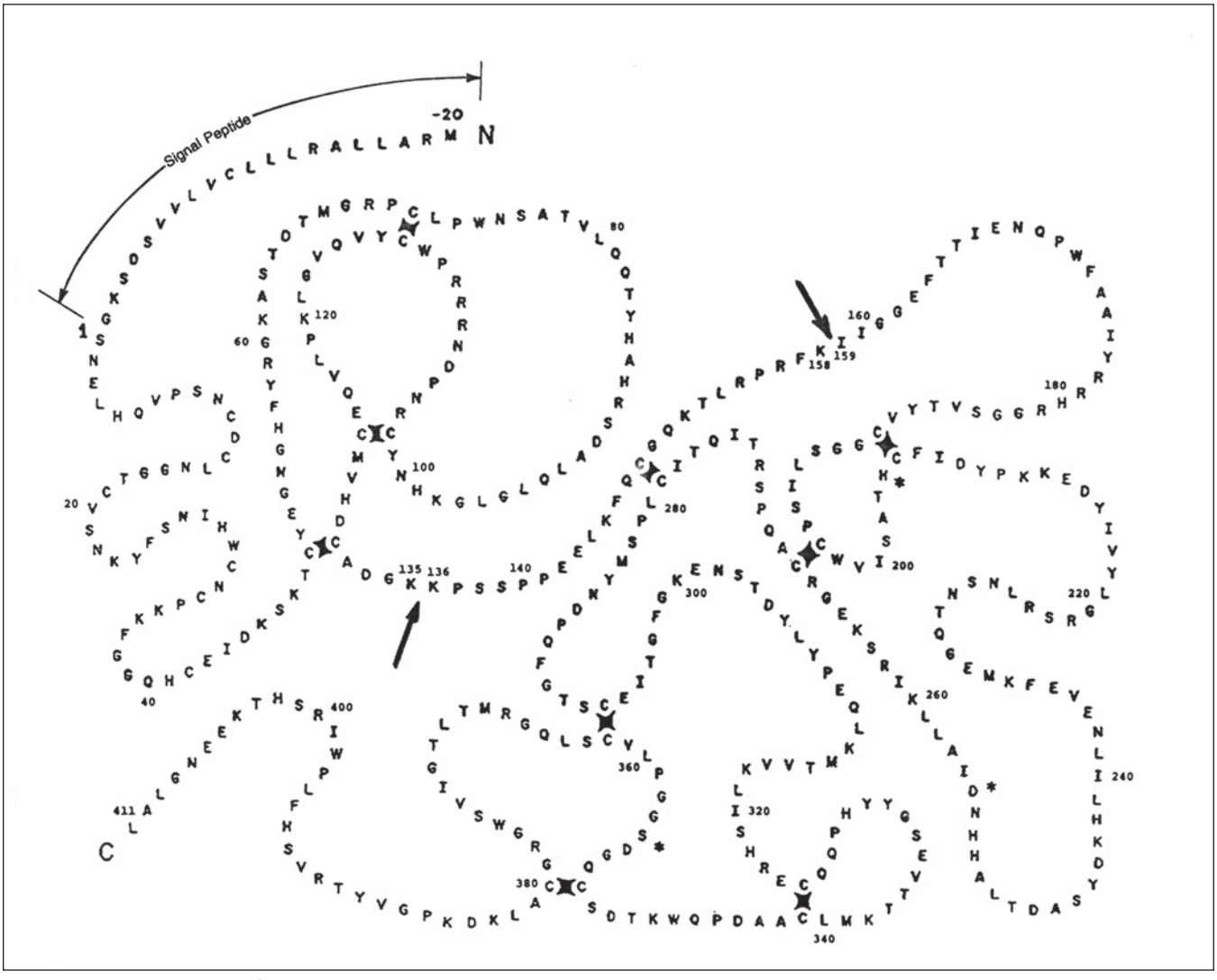
Antibodies that bind to preselected regions of the urokinase molecule have been developed. These antibodies can be used to measure small quantities of each of three molecular forms of urokinase that could be contained in microsamples or conditioned media harvested from cultures of mammalian cells. Previously available antibodies and assay techniques do not yield both clear distinctions among, and measurements of, all three forms.

Urokinase is a zymogen that is synthesized in a single-chain form, called "ScuPA," which is composed of 411 amino acid residues (see figure). ScuPA has very little enzyme activity, but it can be activated in two ways: (1) by cleavage of the peptide bond lysine 158/isoleucine 159 and the loss of lysine 158 to obtain the high molecular-weight (HMW) form of the enzyme or (2) by cleavage of the bond lysine 135/lysine 136 to obtain the low-molecular-weight (LMW) form of the enzyme.

The antibodies in question were produced in mice and rabbits by use of peptides as immunogens. The peptides were selected to obtain antibodies that bind to regions of ScuPA that include the lysine 158/isoleucine 159 and the lysine 135/lysine 136 bonds. The antibodies include monoclonal and polyclonal ones that yield indications as to whether either of these bonds is intact. The polyclonal antibodies include ones that preferentially bind to the HMW or LMW forms of the urokinase molecule. The



Urokinase is synthesized in this form, called "ScuPA," containing 411 amino acid residues. The enzyme is activated by cleaving at the bonds indicated by the arrows. Antibodies can be tailored to distinguish among the active and inactive forms.

monoclonal antibodies include ones that discriminate between the ScuPA and the HMW form. A combination of these molecular-specific antibodies will enable simultaneous assays of the ScuPA, HMW, and LMW forms in the same specimen of culture medium.

This work was done by Dennis R. Morrison of Johnson Space Center and M. Zouhair Atassi of Baylor College of Medicine. For further information, contact the Johnson Commercial Technology Office at (281) 483-3809.

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Johnson Space Center, (281) 483-0837. Refer to MSC-21947.

Understanding and Counteracting Fatigue in Flight Crews

Ames Research Center, Moffett Field, California

The materials included in the collection of documents describe the research of the NASA Ames Fatigue Countermeasures Group (FCG), which examines the extent to which fatigue, sleep loss, and circadian disruption affect flight-crew performance. The group was formed in 1980 — in response to a Congressional request to examine a possible safety problem of uncertain magnitude due to transmeridian flying and a potential problem due to fatigue in association with various factors found in air-transport operations — and was originally called the Fatigue/Jet Lag Program. The goals of the FCG are: (1) the development and evaluation of strategies for mitigating the effects of sleepiness and circadian disruption on pilot performance levels; (2) the identification and evaluation of objective approaches for the prediction of alertness changes in flight crews; and (3) the transfer and application of research results to the operational field via classes, workshops, and safety briefings.

Some of the countermeasure approaches that have been identified to be scientifically valid and operationally relevant are brief naps (<40 min) in the cockpit seat and 7-min activity breaks, which include postural changes and ambulation. Although a video-based alertness monitor based on slow eyelid closure shows promise in other operational environments, research by the FCG has demonstrated that in its current form at the time of this reporting, it is not feasible to implement it in the cockpit. Efforts also focus on documenting the impact of untreated fatigue on various types of flight operations. For example, the FCG recently completed a major investigation into the effects of ultra-long-range flights (20 continuous hours in duration) on the alertness and performance of pilots in order to establish a baseline set of parameters against which the effectiveness of new ultra-long-range fatigue remedies can be judged.

This work was done by Melissa Mallis, David Neri, Mark Rosekind, and Philippa Gander of Ames Research Center; John Caldwell of Air Force Research Laboratory; and Curtis Graeber of The Boeing Company. For further information, visit the FCG website at http://human-factors.arc.nasa.gov/zteam.

Inquiries concerning rights for the commercial use of this invention should be addressed to the Ames Technology Partnerships Division at (650) 604-2954. Refer to ARC-15114-1.